REMARKS/ARGUMENTS

[1] Claims 1-42 are currently pending. Claim 14 has been canceled without prejudice. Claims 10, 27, and 39 have been amended to delete a redundant adjective 'prior.' Claim 15 has been amended to depend from claim 13 instead of canceled claim 14. No new material has been added. Reconsideration and further examination is respectfully requested in view of the below amendments and remarks.

General Remarks

The present invention

Applicant specification describes a network that comprises edge nodes interconnected through core nodes where each edge node stores a description of a route set to each other edge node in the entire network. A route set is defined by a source edge node and a sink edge node and may include numerous routes from the source edge node to the sink edge node, i.e., a route set comprises edge-to-edge routes. An edge-to-edge route may traverse core nodes. The routes are ranked according to some merit criterion, such as propagation delay or a number of traversed core nodes. An edge node is an electronic routing/switching device which interfaces with data traffic sources and sinks. A core node may be electronic or optical based.

Routing: The network employs a very simple edge-controlled routing method where routes of high rank are preferred. The route selection is sequential; the routes are simply tried in an order based on rank, and possibly other factors. A route comprises at least one link, a link being a communications medium joining two nodes (edge and/or core nodes). The routes of different route sets may intersect, and a link in a route that is considered to be of low rank in one route set may be a member of a route that is considered to be of high rank in another route set. One objective of the invention is to devise an integrated control system which aims at maximizing the proportion of edge-to-edge traffic that is routed through routes of high rank in their respective route sets.

Resource allocation: To achieve the above objective, the capacity of each route in a route set may be set according to the spatial distribution of the edge-to-edge traffic which naturally varies with time. The term 'resource allocation' used in the present application refers to adjusting the capacity allocated to edge-to-edge routes through switching at selected core nodes. For example, a link from an edge node to a core node may comprise 32 wavelength channels. In one configuration, the 32 channels may be distributed through the core node to 32 links directed to 32 different nodes, which may be edge nodes or other core nodes. The configuration may be modified later to distribute the 32 wavelength channels among a smaller number of links directed to fewer nodes.

To harmonize the switching function at the core nodes (i.e., the resource-allocation functions) and the route-selection function, which is controlled exclusively by the source edge nodes, the core switching function must learn from the edge-controlled routing function. To do so, a new metric, called a **routing index**, is calculated by each edge node which quantifies the proportion of traffic that uses undesirable routes of lower ranks. When the calculated index exceeds a predefined threshold, the edge node sends requests to corresponding core nodes for link-capacity reallocation, which basically means reconfiguring the switching patterns at the core nodes to increase the proportion of traffic that uses routes of higher ranks.

Provisioning: When a core node receives such requests for link-capacity reallocation from edge nodes, it attempts to reconfigure. If the total traffic is more or less of the same volume and the need for core-switch reconfiguration is caused only by the temporal change of the spatial distribution of edge-to-edge traffic, the reconfiguration process is likely to succeed in meeting the requests. When a core node fails to reconfigure as required, its controller records the failure for the purpose of computing a '**resource-allocation index**'. When the incidents of failures exceed a certain threshold, however defined, the core controller determines that physical intervention is needed and it reports the resource-allocation-failure data to a higher authority; which is a network controller that collects such data from all core controllers. The network controller executes a PROVISIONING procedure and determines, under budgetary constraints, which physical links need be enhanced (and which corresponding nodal interfaces need be added).

Thus, the present invention provides means for harmonizing the functions of the edge-node controllers, the core node controllers, and the overall network controller. This enables the network to autonomously adapt to time-varying traffic and to be equipped for traffic growth.

The Prior Art

Applicant notes that a wide variety of routing methods had been used in packet-based networks. None of the used methods is based on ranking and storing route-sets at each edge node. Routing methods based on the use of route sets were, however, taught in the prior art – for example: U.S. Patents 5,629,930 (Beshai and Yan) titled "Call routing in an ATM switching network"; 6,667,956 (Beshai and Yan) titled "Multi-class network"; 6768718 (Beshai and Blouin) titled "Courteous routing", and 6,920,131(Beshai) titled "Global distributed switch".

The Examiner cited a paper titled "Load-Sensitive Routing of Long-Lived IP Flows", published in SIGCOMM'99 by Shaikh, Rexford, and Shin. The reference is discussed below.

The paper of Shaikh *et al.*

The paper of Shaikh *et al.* addresses a known serious stability problem that arises from the use of load-sensitive dynamic routing in a packet-based communications network. In load-sensitive dynamic routing, the states, however defined, of the links are disseminated (usually by means of flooding) to routers across the network. When a particular link is determined to be overloaded (according to the link's occupancy or the fill of an associated input buffer), the network routers, or a subset thereof, are warned to reduce the traffic directed to the overloaded link. The result is that data will be transferred over routes that exclude the overload link. The load on said particular link may then be reduced significantly and the new link-state advertisements may invite new traffic to use routes that traverse said particular link. The shared routes in the core of the network naturally intersect in common links and, under certain spatial distributions of the traffic, such dynamic routing policy may result in oscillations that can significantly reduce the throughput of the network.

This routing instability is caused by two important factors. The first is the delay between the instant of overload detection and the instant at which a distant router gets the information. The second is the nature of link-state dissemination to multiple routers which are not aware of the intentions of each other. The result is that the link in question may oscillate between feast and famine. There are several methods for reducing such oscillations, but these are partially effective and may significantly increase network complexity.

The paper of Shaikh *et. al* provides a partial solution that considers the first factor only. It considers the effect of link-state communication delay but does not consider the effect of untargeted advertisement (warning to avoid a link or invitation to use it). The proposed solution in Shaikh is based on the observation that if the duration of each flow is significantly larger than the delay incurred in communicating link-state messages, then the oscillations can be significantly reduced. Shaikh et al. further observe that while the number of flows of low duration, observed over a given period of time, may be larger than the number of flows of large duration, the actual volume of data belonging to the large-duration flows may be larger than the volume of data belonging to the flows of low duration (the wealth of a few billionaires may exceed the wealth of the rest of the population). Therefore, it would be prudent to use load-sensitive routing for only the flows of large duration and use static routing over pre-provisioned routes for the rest of the flows. To realize this discriminating routing policy, the capacity of a link may be divided into two parts. A first part would be allocated to flows of long duration and a second part would be used for flows of low durations. The load state of the first part only is advertised in a conventional manner to enable load-sensitive dynamic routing for long-lived flows. The second part of the link capacity is used for static routing.

In summary, Shaikh teaches the following:

1. A load-sensitive routing system based on using static routing for short-lived flows and load-sensitive dynamic routing for long-lived flows.

2. A resource allocation method defined as a process of dividing the capacity of each link individually between short-lived flows and long-lived flows.

3. A network provisioning process defined in the main text of the paper as a synonym of resource allocation as defined in (2) above, i.e., a process of dividing the capacity of each link individually between short-lived flows and long-lived flows.

4. A network provisioning process defined in the Appendix (Section A.2) as a process of sizing each link INDIVIDUALLY based on a corresponding volume of traffic offered to the link.

5. Both the resource allocation process and the network provisioning process, according to either of the two definitions, are driven by the traffic volume of each flow type (short lived or long lived) at the input of each link.

Applicant notes that Shaikh teaches neither a **routing index** that can influence the resource-allocation process, nor a **resource-allocation index** that can influence the provisioning process as defined in the Appendix of the paper.

Applicant outlines below several differences between the method of the reference (hereinafter 'method-1') and the method described in several of the claims of the present invention (hereinafter 'method-2').

(A) Method-2 in several embodiments selects a path for a flow from among a set of ranked routes in a respective route set. Method1 selects a path according to conventional methods with the added step of traffic segregation on each link according to perceived flow duration (short lived *versus* long lived).

(B) Method-2 in several embodiments uses a **routing index** determined by an edge node (edge router) to modify the capacities allocated to edge-to-edge routes; route capacity is modified by core nodes based on routing indices received from edge nodes. The routing index is a function of **route depth** within a route set. Method-1 simply divides the capacity of a link between long-lived and short-lived flows according to measured traffic volumes of the two flow types. The notion of a routing index or route depth would be inapplicable in the system described in Shaikh.

(C) Method-2 in several embodiments provides **resource-allocation indices**, computed by core nodes, as an input to a network-wide provisioning process implemented by a network controller. The provisioning process specifies additional links, and corresponding router/switch interfaces, that need be physically installed. There is no parallel process in method-1.

(D) Method-1 is heavily dependent on the statistical distribution of flow duration. Method-2 is advantageously applied independent of flow duration or priority.

(E) Method-1 is limited to the ability to partition the capacity of a link. Method-2 may flexibly provide three degrees of freedom including: (1) the ability to choose a route from among a number of routes constituting a route set stored at each edge node; (2) the ability to modify the capacities allocated to edge-to-edge routes within a route set through configuring core nodes; and (3) the ability to pinpoint required physical installations on a continuous basis, thus enabling a harmonious network operation and provisioning for growth.

The Examiner refers to specific passages in the paper of Shaikh *et al*:

1. Page 215, Column 1, Paragraph 1 to Column 2 Paragraph 1;
2. Page 218, Section 2.2;
3. Page 218, Column 2, Paragraphs 3 and 4;
4. Page 219, Column 1, Paragraph 1
5. Page 219, Column 2, Paragraph 1;
6. Page 219, Column 2, Paragraph 2;
7. Page 219, Column 2, Paragraphs 1 and 2;
8. Page 219, Column 2, Paragraphs 2 and 3;
9. Page 219, Column 2, Paragraph 3;
10. Page 219, Section 3;

11. Page 219, Section 3.1;
12. Page 220, Column 1, Paragraph 1
13. Page 220, Section 3.3;
14. Page 220, Column 2, Paragraphs 2;
15. Page 220, Column 2, Paragraphs 2 and 3
16. Page 220, Column 2, Paragraph 3; and
17. Page 220, Column 2, Paragraph 3 to Page 221, Column 1, Paragraph 1.

Applicant has carefully reviewed the reference to detect any similarity of the methods taught therein to those of the present invention. Applicant notes a significant difference in the interpretation of the terms ‘allocation’ and ‘provisioning’ as used in the reference and the present application.

In Shaikh, the terms ‘allocation’ and ‘provisioning’ have been used interchangeably throughout the main text of the paper to mean the same thing, then the term ‘provisioning’ was defined differently in Section A.2 of the Appendix.

Throughout the main text, the two terms are used to mean dividing the capacity of a link into two parts, routing short-lived flows to one part and long-lived flows to the other part. In the Appendix, Section A.2, the interpretation of “resource allocation” remains unchanged: “We use the duration distribution to allocate link capacity to N_{short} and N_{long}” (Page 225, column 2, third paragraph). However, the term “Network provisioning” is redefined: “After computing all shortest paths between each pair of routers, we determine the traffic volume on each link, assuming that a source communicates with equal frequency with each destination” (Shaikh, page 225, column 2, second paragraph). This is a sharp departure from the previous definition throughout the text. See, for example:

(1) Page 216, Column 2, “Network Provisioning rules: We propose simple and robust rules for allocation network resources for short-lived and long-lived flows and techniques for sharing excess link capacity between the two traffic classes.”

(2) Section 3.3 “The simplest provisioning model divides link bandwidth in proportion to the amount of statically-routed and dynamically routed traffic”. Section 4.4, titled “Network provisioning” describes the division of link capacity between short-lived and long-lived flows.

Section A.2 suggests that each link be dimensioned based on its traffic volume. Applicant notes that this method of dimensioning each link in isolation does not take into account the inter-dependence of link states and simply treats the symptoms, not the cause, of traffic overload. The technique was used in the early days of the telephone network. With the advent of machine computing, network provisioning was upgraded to use network dimensioning tools, based on end-to-end traffic measurements, which take into account the inter-dependence of link states. End-to-end traffic in the telephone network is reasonably stable and relatively easy to characterize. In data networks, end-to-end traffic is not easy to characterize and the provisioning method of the present invention offers a viable solution which does not require such characterization.

Rejections under 35 U.S.C. §102

[3] Claims 1-42 are rejected under 35 U.S.C. 103(a) as being anticipated by Shaikh “Load Sensitive Routing of Long Lived IP Flows”. In order to support a rejection under 35 U.S.C. §102, *every* limitation of the claims must be shown or suggested in the prior art. Applicant submits that Shaikh fails to satisfy this burden for the following reasons.

[4] Regarding Claim 1, the Examiner asserts that Shaikh teaches the substantive limitations of the claim. Reference is made to: passages 2, 3, 5, 6, 8, 13, 16, and 17.

Applicant respectfully disagrees. Claim 1 of the present invention describes a multi-stratum multi-timescale control system comprising: **routing means** operating at a first stratum on a first timescale for providing routing functions; **resource**

allocation means operating at a second stratum on a second timescale for providing resource allocation functions; and **provisioning means** operating at a third stratum on a third timescale for providing provisioning functions. Each successive timescale is coarser than its preceding timescale; and a lower stratum network function provides network information to a higher stratum network function.

Applicant respectfully asserts that Shaikh does not contemplate the use of a multi-stratum multi-timescale control system where each stratum (except the highest) passes control information to a higher stratum.

With respect to routing, Shaikh divides traffic flows into 'short lived' and 'long lived' flows then develops a routing scheme that treats each flow according to its perceived duration (short or long). Section 2.2 in Shaikh describes a distinctive routing scheme based on such traffic classification. The purpose is to lessen the effect of a known routing instability which is specific to the load-sensitive routing protocols.

With respect to resource-allocation, Shaikh partitions the capacity of a link into two parts, one to carry flows of short duration and the other to carry traffic of long duration. Applicant points out that the technique of dividing link capacity among traffic streams of different attributes has been known for several decades. Passage 3 describes a process for link-state distribution to enable load-sensitive routing. The term "Resource allocation" in Shaikh refers to the process of link-capacity division (Please see passage 3 "Instead, we define link state in terms of the resource allocated to the long-lived flows").

With respect to provisioning, In Section 3.3 Shaikh states "The simplest provisioning model divides link bandwidth in proportion to the amount of statically routed and dynamically routed traffic", and a formula is given to determine the proportion as a function of the number of packets in short-lived flows and long-lived flows.

Thus, through inconsistent nomenclature, the process of reserving a part of the capacity of a link for long-lived traffic is considered a resource-allocation process in passage 3 and a provisioning process in passage 13.

The Examiner appears to equate the conventional trunk reservation process described in section 3.3 in Shaikh with the provisioning function of the present invention. Applicant respectfully notes that the term "provisioning" has been traditionally used to refer to a process of computing required **new** network resources. Network provisioning has traditionally been carried out based on collecting network-wide usage data and executing sophisticated off-line network planning-optimization tools. The slow pace of such a process (with a typical delay of several months) is one of the main motivations of the fully automated integrated control system of the present invention. Applicant asserts that Shaikh does not suggest an integrated control system. This is understood because the sole objective of Shaikh is to develop a stable routing discipline.

The provisioning process is characterized in the present application (Publication 2003-0126246) paragraph [0136]: "The provisioning function produces resource-installation requirements". Also see paragraph [0140]: "At each provisioning interval, the provisioning function has a resource budget determined by the network operator. Upon the reception of the list of candidate links from the edge controllers and the core controllers, the network controller distributes the resource budget among the candidate links according to established rules."

With respect to the essential feature in claim 1 of the present invention that "each successive timescale being coarser than its preceding time scale", the Examiner refers to passages 5 and 17 from the Shaikh reference. The Examiner also adds a comment that layer 3 routing function inherently operates on a finer (individual packet) time scale.

Applicant respectfully points out that passage 5 refers to a process of detecting long-lived flows and switching routing policy after a certain usage threshold is reached. Passage 17 describes the process of dividing the capacity of an individual link between the two types of flow (short-lived and long-lived). Thus, passages 5 and 17, and the Examiner's observation regarding the duration of a packet-forwarding process are all related to a discriminating routing function and a process of providing distinctive routing according to perceived flow duration. The successive time scales of claim 1 are associated with the three distinct functions of

routing, resource allocation, and provisioning which do not exist as such in the Shaikh reference.

Applicant also notes that the process of integrating the three control functions of routing, resource allocation and provisioning requires a network of coordinated controllers, which in the present invention have been characterized as edge controllers, core controllers, and a network controller. The Shaikh reference does not include a single diagram of a network, and the word controller was not mentioned even once. This is not surprising; because the objective of the paper is introduce a method of packet classification for routing purposes.

With respect to the feature in claim 1 that a lower stratum network function provides network information to a higher stratum function and the higher stratum function makes control decisions based on the information, the Examiner refers to passages 8 and 16 In Shaikh. Applicant notes that passage 8 describe the use of traditional routing methods with the added function of observing the load on each link for the purpose of dividing link capacity between the short-lived and long-lived flows. There is no suggestion in Shaikh of information passing between successive strata in a multi-stratum control system.

As such Shaikh fails to suggest a control system that includes the three functions of routing, resource allocation, and provisioning stated in claim 1 of the present invention, with information passing from one stratum to another. For at least this reason, in addition to those cited above, it is respectfully requested that the rejection of claim 1 be withdrawn.

[5] The Examiner asserts that Shaikh teaches the features of claims 2 to 8 of the present invention.

The Examiner asserts that Shaikh provides:

(a) A routing index metric (reference made to passage 7);

(b) Automated measurement of a plurality of routes in a route set (reference made to passage 9);

(c) State information measurements along an entire route (reference made to passage 9);

(d) The concept of route depth (reference made to passage 5);

(e) The concept of constituent traffic (passage 5);

(f) Traffic classification with respect to defined thresholds (passage 5);

(g) Means for measuring efficacy of route selection (reference made to passage 12).

With respect to assertion (a), Applicant respectfully notes that the novel concept of a **routing-index metric** was first introduced in the present application. As described in the specification (publication 2003-0126246, paragraph 0088), **"A routing index is a metric, associated with a route-set, that measures the result of the route selection procedure."** Paragraphs 1 and 2, column 2, page 219 in Shaikh describe a process of detecting long-lived and short-lived flows for routing discrimination. The third paragraph in column 2, page 219 describes the use of metrics that represent the reserved resource on each link: "Dynamic routing of long-lived flows draws on metrics that represent the reserved resources on each link. Link-state advertisements can be flooded throughout the network as in QOSPF and PNNI, …". This has no resemblance whatsoever to the routing index which characterizes and quantifies the route selection process according to the depth of a selected route within a route set. The routing index is associated with route sets and is meaningless otherwise. A route set is specific to each directed edge-node pair and is a list of all routes from the source edge node to the sink edge node of the edge-node pair. Naturally, Shaikh would have no use for a routing index as defined in the present application simply because shaikh is using conventional Internet routing protocols with the added step of dividing the capacity of each link between traffic flows according to their durations.

With respect to assertion (b), Applicant respectfully notes that Shaikh does not, explicitly or implicitly, consider such automated measurement. Shaikh uses

measurements of short-lived and long-lived traffic at the input of each individual link for use in partitioning the link's capacity between the two flow types.

With respect to assertion (c), the referenced passage describes the traditional link-state advertisements through FLOODING throughout the network. Applicant notes that flooding is the cause of network problems that Shaikh attempts to ease.

With respect to assertion (d), the referenced passage in Shaikh describes a process of flow characterization with respect to duration (short-lived versus long-lived) and mentions the use of traditional forwarding techniques (with the example of OSPF). The concept of **route depth**, which was first introduced in the present application, is a measure of traffic that was forced to use undesirable routes of low rank within their respective route sets. No such metric is contemplated in Shaikh.

As described in the specification of the present application, the edge-to-edge routes within each route set (where a route set is specific to a directed edge-node pair) are ranked according to some merit criterion with the top-ranked (most desirable) routes appearing at the beginning of the ordered route-set and low-ranked routes appearing deeper in a route-set. In setting up a connection from a first edge node to a second edge node, the most preferred routes in the route set containing routes from the first edge node to the second edge node are tried first and the rank of the first available route is defined as the route depth. In accordance with the present invention, this new metric can be used to efficiently provision the entire network. Shaikh considers a traditional network employing traditional routing and, hence, would not contemplate the use of the route-depth metric.

With respect to assertion (e), Applicant respectfully notes that Shaikh does not contemplate using the concept of constituent traffic. The concept, as introduced in the present invention, divides traffic streams into primary streams that are successfully routed through highly-ranked (most desirable) routes and secondary streams that are forced onto routes of lower ranks in their respective route sets. A link in a route of a low rank in one route set may be a member of another route of a high rank in another route set. Therefore, proper network provisioning (using the formal definition of network provisioning, which is to optimally determine and install

network elements and connecting links) ensures that most of the traffic streams can be routed through routes of high ranks within their respective route sets. Tracking constituent traffic as defined in the specification and summarized above is an effective way of precise network provisioning.

With respect to assertion (f), Applicant notes that Shaikh classifies traffic at each link individually according to flow duration while the present invention classifies traffic according to the rank of the edge-to-edge route within a route set. Traffic classification according to the present invention is independent of the flow duration and depends only on a merit of the selected end-to-end route.

With respect to assertion (g), Applicant notes that the referenced passage describes a process of admission control. In the present invention, the efficacy of route selection is a measure of the overall efficiency of the routing system which, in turn, is a measure of the adequacy of the network provisioning process.

Accordingly, for at least these reasons, it is respectfully requested that the rejection of claims 2-8 be withdrawn.

[6] Regarding claims 9-12, the Examiner asserts that Shaikh teaches

(h) Resource allocation functions that provide network information in the form of a resource index metric (reference made to passage 15);

(i) Resource allocation index metric created based on automated measurements of prior allocation data (reference made to passage 4);

(j) Means for measuring efficacy of resource allocation based on a resource allocation index metric (Reference made to passage 13); and

(k) Functions which configure the network so as to satisfy resource allocation requirements (reference made to passage 6).

With respect to assertion (h), Applicant notes that the reference divides the capacity of a link between two flow types and does not produce a resource index metric.

With respect to assertion (i), Applicant notes that there is no mention in the reference of a system for retaining prior allocation data.

With respect to assertion (j), Applicant notes that there is no mention in the reference regarding measuring or evaluating resource allocation.

With respect to assertion (k), Applicant notes that the referenced passage refers to the use of conventional label switching to select a path not to configure the network. The limitation of claim 12 of the present application refers to providing physical resources based on the resource-allocation functions.

Accordingly, for at least the above stated reasons, it is respectfully requested that the rejection of claims 9-12 be withdrawn.

[7] Regarding claims 13-16, the Examiner asserts that Shaikh teaches:

(l) Provisioning functions that provide network information in the form of a constituent traffic metric (reference made to passages 9 and 12);

(m) Provisioning functions that provide network information based on automated measurements of the amount of traffic carried on various links of the network (reference made to passage 12);

(n) Measurements of accepted primary traffic, accepted secondary traffic, and rejected traffic (reference made to passage 17);

(o) Constituent-traffic metric determining network provisioning requirements (reference made to passage 14).

With respect to assertion (l), Applicant notes that the term "constituent traffic" has a very specific meaning. The constituent traffic in a given route comprises primary traffic flows, for which the given route is a highly-ranked route, and

secondary traffic flows which were forced to use the given route because its corresponding highly-ranked route is fully utilized. A large proportion of the volume of the secondary traffic flows is indicative of improper resource allocation which, in turn, could be indicative of a need for physical interference to install links and corresponding nodal interfaces. Shaikh does not provide any mechanism for identifying the traffic flows according to their assigned routes.

With respect to assertion (m), it is related to claim 14 which states that the constituent-traffic metric is created based on automated measurements. Applicant notes that automated measurements are taken for granted in any state-of-the-art network. Claim 14 is simply stating that constituent traffic is measured automatically. Claim 14 has been canceled without prejudice.

With respect to assertion (n), Applicant notes that Shaikh divides the flows at a given link into short-lived and long-lived. This is a localized classification that is decided at the sending node of the given link. Shaikh does not provide any mechanism for tracking a traffic flow according to the rank of the route to which the flow is assigned. Claim 15 has been amended to depend from claim 13 instead of canceled claim 14.

With respect to assertion (o), Applicant notes that in addition to the absence of constituent-traffic metric in Shaikh, the provisioning requirements in Shaikh, according to either of the two definitions of "provisioning" provided therein are determined directly from localized traffic-volume information and not from any network-related metrics.

Accordingly, for at least the above stated reasons, it is respectfully requested that the rejection of claims 13, 15 and 16 be withdrawn.

[8] Regarding claim 17, the Examiner asserts that Shaikh teaches routing means that includes an edge controller, resource allocation means that includes a core controller, and provisioning means that includes a network controller (reference is made to passage 1). The Examiner further states that such components are inherent to any large backbone network.

Applicant respectfully notes that there is no mention of any controller any where in the Shaikh reference. As mentioned earlier the terms "provisioning" and "resource allocation" are used synonymously in the main text of the paper of Shaikh *et al.* to mean partitioning a link. The term "provisioning" is then used in the Appendix, Section A.2, to mean dimensioning each individual link based on its input traffic.

The Examiner correctly states that edge controllers, core controllers, and network controllers are inherent to any large network. However, claim 17 associates such controllers with the basic functions of the claimed integrated control system. For at least the reason that there is no mention of controllers in Shaikh, it is respectfully requested that the rejection be withdrawn.

[9] Regarding claims 18-20, the Examiner asserts that Shaikh teaches

(p) Integrated resource allocation means and provisioning means (reference made to passage 10);

(q) Integrated second and third strata (reference made to passage 16);

(r) Unified second and third time scales (reference made to passage 16).

With respect to assertion (p), Applicant notes that the referenced passage 10 uses the two terms "resource allocation" and "provisioning" synonymously. Giving two names to one object yields indefiniteness not an integrated object.

The resource allocation function and the provisioning function as redefined in the Appendix, Section A.2, are independent of each other and both are driven by the volume of traffic at the input of each link.

With respect to assertion (q), Applicant cannot find any insinuation of an integrated second and third strata in passage 16.

With respect to assertion (r), Applicant refers to the argument regarding assertion (p).

Accordingly, for at least these reasons it is respectfully requested that the rejection of claims 18-20 be withdrawn.

[10] Regarding claims 21-30, as the Examiner noted, they present the same limitations of claims 1-3, 15, 8, 12, 10, 11, 13, 14, and 16 and corresponding previous Applicant arguments apply to claims 21-30. As such, the claims are patentably distinct over Shaikh for at least the reasons provided above, and it is respectfully requested that the rejection be withdrawn.

[11] Regarding claim 31, the Examiner asserts that Shaikh teaches the substantive limitations. Reference is made to passage 11 and passage 8

Applicant respectfully notes that claim 31 of the present application includes program code related to selection of a candidate route from a route set in order of rank and determining a routing index. Shaikh does not employ, or suggest, selecting a candidate route from a ranked route set, and Shaikh does not use the concept of a routing index which is based mainly on route depth within a ranked route set. For at least this additional reason, the rejection of claim 31 is improper and it is respectfully requested that it be withdrawn.

[12] Regarding claims 32-36, the Examiner indicated that they present no substantive limitations over claims 4-8. Applicant arguments regarding claims 4-8, given in paragraph [5] of this response paper apply to claims 32-36. As such, the claims are patentably distinct over Shaikh for at least the reasons provided above, and it is respectfully requested that the rejection be withdrawn.

[13] Regarding claims 37-42, the Examiner indicated that they present no substantive limitations over claims 1-3, 15, 8, 12, 10, 11, 13, 14, and 16. Applicant's corresponding previous arguments apply to claims 37–42. As such, the claims are patentably distinct over Shaikh for at least the reasons provided above, and it is requested that the rejection be withdrawn.

[14] Applicant thanks the Examiner for fully considering Applicant's previous arguments.

[15] Applicant thanks the Examiner for withdrawing previous rejections.

[16] Applicant has carefully reviewed the reference.

[17] Applicant has carefully reviewed pertinent U.S. Patent 6,801,502.

Conclusion

Applicant has made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Lindsay G. McGuinness, Applicant's Attorney at 978-264-6664, extension 304, so that such issues may be resolved as expeditiously as possible.

In view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

May 1, 2006
Date

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